

### 3 ROUTINE MONITORING EVENTS (SEDIMENT QUALITY)

Monitoring will be performed at Deposit 1 to confirm that the remedial action achieves the performance standards specified in the CD and CAP. The objectives of long-term monitoring at the Deposit 1 are as follows:

- To verify that the cap is sound and not substantially eroded over time by natural and anthropogenic forces.
- To verify that the sediment surface (nominally 0 to 10 cm) is not recontaminated above the cleanup standard of 62 micrograms/kilogram dry weight basis (62 µg/Kg dw).
- To verify that PCBs capped at Deposit 1 are not migrating upward through the cap.
- To generally document the performance of the cap for inclusion in the 5-year review conducted by Ecology.

#### 3.1 Sediment Monitoring Rationale

As described in the Final CAP (Ecology 2005), multiple physical and chemical analysis surveys have been performed on the sediments in the vicinity of Deposit 1. These investigations include:

- Ecology's 1993-94 Investigations (Ecology 1995b)
- Kaiser's 1994 Investigations (Hart Crowser 1995)
- Ecology's 1999 Survey (Johnson 2000)
- Ecology's 2000 Sediment Toxicity Tests (Johnson and Norton 2001)
- EPA's 2001 Coeur d'Alene Basin Remedial investigation/Feasibility Study (EPA 2001)
- Avista's and Kaiser's 2001 Investigation (Exponent and Anchor 2001)
- Avista and Kaiser's 2005 Focused Remedial Investigation Report (Anchor 2005a)
- Avista and Kaiser's 2005 Focused Feasibility Study (Anchor 2005b)

These events were analyzed to complete a characterization of the nature and extent of the PCB sediment contamination at Deposit 1. Ecology selected 62 µg/Kg total PCBs in the sediment as the cleanup level that will be protective of human health and the river ecological community. The selected cleanup remedy addressed the PCB-contaminated sediments and is detailed in the Engineering Design Report. The remedy requires placement of a minimum 13-inch cap over the identified PCB contaminated sediments at Deposit 1. The cap will consist of a minimum of 4 inches on bituminous coal acting as an

absorptive layer overlain by a minimum of 6 inches of sand. The final layer will consist of 3 inches of protective armor. The cap is designed to physically isolate the PCB-contaminated sediments below the biologically active zone (0-10 cm), stabilize the subsurface PCB-contaminated sediments from potential worst-case hydrodynamic forces, and reduce the transport of dissolved PCBs into the overlying water column.

This long-term monitoring plan was developed to ensure that the above stated design objectives are met and that cap performance data could be evaluated after 5 years. This long-term monitoring plan will consist of evaluations at Years 2 and 4 and following major flood events. Cap performance evaluations will include hydrographic surveys to assess the cap thickness and its resistance to erosive forces over time. Surface and subsurface sediment sampling will also be conducted to verify that the 62 µg/Kg dw sediment cleanup level is maintained and that dissolved PCBs have not migrated up through the cap. As part of each 5-year review, Ecology will make a determination regarding necessary long-term monitoring.

### **3.2 Sediment Monitoring Strategy**

Each long-term monitoring event at Deposit 1 will encompass two broad categories:

- Physical Integrity Performance Monitoring
- Sediment Quality Confirmation Monitoring

The physical integrity monitoring will be conducted by a hydrographic survey conducted at the start of each sampling event. The survey will be used to evaluate the cap thickness by comparing the surface of the cap from the post-construction survey that serves as the as-built condition. Based on the results of the survey, cap areas of relatively greater erosion or settlement will be targeted (in part) as locations to conduct sediment quality monitoring. Visual inspections by divers to evaluate cap erosion may also be required to further detail the physical integrity of the cap and located potential surface sediment sampling locations, as necessary.

Sediment quality monitoring will be conducted at five locations on the Deposit 1 cap. Two surface sediment grab locations will be chosen following the hydrographic survey and will be biased towards relatively low spots on the cap. Three subsurface sediment cores will be

collected at locations corresponding to pre-design sampling stations. Sediment sampling locations will be proposed to Ecology for approval prior to initiation of field efforts. The following section describes the methods to be used to perform the sediment sampling.

### **3.3 Sediment Sampling Locations and Methods**

Methods and procedures for the bathymetric survey and sediment sampling are provided below. Detailed procedures, QA/QC guidelines, and other organizational details are found in the SAP (Appendix D of the Engineering Design Report). The SAP specifies procedures that ensure sample collection, handling, and analysis will result in data of sufficient quality to evaluate the effectiveness of remedial actions at Deposit 1.

#### **3.3.1 Bathymetric Surveys**

Bathymetric surveys will be performed over the full extent of the capping area as depicted in the construction drawings (Appendix A, Sheet B1). The surveys will be completed in general conformance with a Corps of Engineers Class I survey (EM 110-2-1003) with the following modifications:

- Tracklines will be placed on 25-foot centers (versus 100-foot centers as specified in EM 110-2-1003)
- Surveys will tie into a local elevation datum

Survey methods and transect locations will be similar between each long-term monitoring survey to allow detailed comparisons. Changes in bathymetry will be evaluated to identify areas of net erosion or deposition relative to post-construction conditions. A moderate concern area of potential erosion will be assigned when the total cap thickness is within 6 inches of the minimum 13-inch specification (i.e., total cap thickness of between 13 and 19 inches). A high concern area of potential erosion will be assigned when the total cap thickness is less than the minimum 13-inch specification. A moderate concern exceedance may trigger sediment sampling in that area to verify that surface sediments at that location are maintained below 62 µg/Kg dw total PCBs, whereas a high concern exceedance may trigger additional contingency evaluations.



### **3.3.2 Surface Sediment Sampling**

Surface sediment samples from the 0 to 10 cm biologically mixed surface layer will be collected for chemical and physical testing using a van Veen grab sampler or equivalent in accordance with Puget Sound Estuary Program (PSEP) protocols (PSEP 1997). Upon contact with sediments, the jaws will be drawn shut to collect the sample. As described in the SAP, samples will be collected in the following manner in accordance with the PSEP protocols:

- The sampling vessel will be positioned within 3 meters of the desired location. At the time of sampling, the geodetic horizontal position (i.e., latitude and longitude) of each sample location will be documented to the nearest 0.01 seconds.
- Water depth will be recorded at each sample location. Depth will be determined by leadline measurements or a depth finder.
- The van Veen will be decontaminated and deployed.
- The sediment sample will be retrieved aboard the vessel and evaluated against the following PSEP acceptability criteria:
  - van Veen sampler is not overfilled (i.e., there is no sediment surface against top of sampler)
  - Sediment surface is relatively flat, indicating minimal disturbance or winnowing
  - Overlying water is present, indicating minimal leakage
  - Overlying water has low turbidity, indicating minimal sample disturbance
  - Desired penetration depth is achieved
- Overlying water will be siphoned off and a stainless steel trowel or similar device will be used to collect only the desired sediment fraction from inside the van Veen sampler, taking care not to collect sediment in contact with the sides of the sampler.
- The desired sediment fraction from the inside of the van Veen sampler will be placed in a high-density polyethylene (HDPE) bucket or stainless steel bowl. Sediment from multiple grabs may be necessary to collect sufficient sample volumes for analysis. When sufficient sample volume has been collected, the sediment will be homogenized using a stainless steel spoon or variable speed drill fitted with a stainless steel paddle.



- Homogenized sediment will be placed immediately into appropriate pre-labeled sample containers and placed immediately on ice for transport to the appropriate laboratory.

### **3.3.3 Subsurface Sediment Sampling**

During the Years 2 and 4 monitoring events, sediment cores will be collected at three predetermined locations within Deposit 1 (SC-1, SC-2, SC-3; Figure 1) to verify the predicted lack of upward migration of PCBs through the cap. If chemical sampling results from the cores warrant alternative methods for evaluation, bioassay testing can be added as a possible contingency method.

The primary means to collect subsurface sediments will be piston coring. The piston corer will be lowered to the appropriate depth. When that depth is reached, the piston will be tied off and the core tube pushed to the required depth.

The minimum acceptable penetration depth for a successful core will be 1 or more feet below the bottom of the Deposit 1 cap. If these acceptance criteria are met, the core will then be capped and delivered onshore for processing.

The procedure for piston coring is described in the SAP and summarized below:

- Clean and rinse the tubes in a solution of laboratory grade non-phosphate based soap and potable water.
- Logs and field notes of all core samples will be maintained as samples are collected and correlated to the sampling location map. The following information will be included in this log:
  - Water depth at each boring location
  - Location of each boring station as determined by differential global positioning system (DGPS)
  - Date and time of collection of each sediment core sample
  - Names of field supervisor and person(s) collecting and logging in the sample
  - Observations made during sample collection including: weather conditions, complications, and other details associated with the sampling effort
  - The sample station number



- Length and depth intervals of each core section and recovery for each sediment sample
- Qualitative notation of apparent resistance of sediment column to coring
- Any deviation from the SAP.
- When retrieved, each core will be inspected and a physical description of the material at the mouth of the core will be entered into the core log.
- Core tubes longer than 4 feet will be cut in half to facilitate upright storage. The core sections will be stored upright in iced containers for transport to the core processing facility.
- At the core processing facility, the cores will be cut open and a sediment description of each core sample will be recorded on the core log for the following parameters as appropriate and present:
  - Sample recovery (depth in feet of penetration and sample compaction)
  - Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, color)
  - Odor (e.g., hydrogen sulfide)
  - Wood material and other debris
  - Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
  - Presence and depth of the redox potential discontinuity layer
  - Any other distinguishing characteristics or features
- Sample intervals will target three layers: the sand material, the coal material, and the 1-foot layer below the cap

Should piston coring through the armor layer of the cap not prove successful, alternative methods such as diver-assisted sampling may need to be employed.

Table 1 lists the coordinates for the three pre-determined sediment core locations.



**Table 1**  
**Subsurface Sediment Core Locations for OMMP**

Station ID	North	East
SC-1	270177.6086	2504159.489
SC-2	270431.3043	2504823.596
SC-3	270646.5082	2505254.006

State Plane NAD83  
Washington North - 4601  
U.S. Survey Feet

### 3.4 Sample Analyses

All surface and subsurface sediment samples collected will be analyzed for PCB Aroclors using EPA Method 8082, total organic carbon (TOC), total solids, and grain size. At least one sample from each location will be frozen at -20°C and archived for potential future analyses.

